Attachment 5. Work Plan

TECHNICAL APPROACH

The technical approach to assessing the feasibility of the Littlerock Creek Groundwater Recharge and Recovery Project (LCGRRP) consists of: describing alternative preliminary facility and operating plans based on existing information, developing a complete set of questions that need to be answered to determine feasibility, and the execution of technical investigations to answer those questions. The feasibility questions and related investigations have been structured to identify fatal flaws early and to ensure that the least expensive approach to feasibility assessment is followed. The following questions need to be answered to assess project feasibility.

How much imported water is available for recharge?

This is a complicated issue and needs to be broken down into a series of sub-questions related to the availability of State Water Project (SWP) and non-SWP waters and available capacity in the SWP to convey water to the LCGRRP. These sub-questions include:

- What water are we talking about—SWP water or other non-SWP water conveyed through the SWP facilities, or both?
- When is surplus capacity in the SWP available, and is this surplus capacity available when needed to convey SWP and non-SWP waters to the LCGRRP?
- What are the institutional arrangements required to acquire non-SWP water and convey it through the SWP facilities to the LCGRRP?

The feasibility investigation must clearly investigate and articulate what imported waters would be used for recharge, the timing of deliveries, the probable range of cost of these waters as delivered to the LCGRRP, and the institutional arrangements required to deliver these waters to the LCGRRP.

How much recycled water is available for recharge?

This question is seemingly easier to answer than the question above as it involves local producers of recycled water and coordination among local agencies. The sub-questions that need to be answered include:

- What are the current and projected recycled water production rates of the Los Angeles County Sanitation District's Palmdale Water Reclamation Plant and Lancaster Water Reclamation Plant?
- How much of this recycled water is committed to other reuse projects, and how much is potentially available for recharge at the LCGRRP?
- What facilities would be required to convey recycled water to the LCGRRP?
- What are the institutional arrangements required to acquire recycled water and convey it to the LCGRRP?

The feasibility investigation must clearly investigate and articulate what recycled water could be used for recharge, the timing of recycled water deliveries, the probable cost of recycled water as delivered to the LCGRRP, and the institutional arrangements required to deliver and recharge recycled water at the LCGRRP.

What recharge and recovery facilities could be constructed in the LCGRRP area, how would they be operated, and what will they cost?

The recharge and recovery capacities of the project are projected to be about 43,000 acre-ft/yr and 14,000 acre-ft/yr, respectively. Two project concepts were previously identified in the LCGRRP project description and are repeated below. In its simplest form the proposed LCGRRP could consist of the following:

- SWP and other imported waters would be discharged from the East Branch of the SWP aqueduct where the aqueduct crosses Littlerock Creek. Imported water would be conveyed in the active channel of Littlerock Creek toward the project endpoint located about nine miles downstream of the aqueduct.
- Imported water discharge to Littlerock Creek would be modulated to ensure that all imported water discharged to Littlerock Creek recharges in the active channel in the project area.
- Imported water recharge will occur when capacity exists in the East Branch of the aqueduct, primarily in the winter time over a period of 90 to 120 days.[1] Recharge could occur at other times of the year provided that there is SWP water available surplus to the then current demand or when surplus capacity in the aqueduct is available to convey non-SWP water to the LCGRRP.

The project would be expanded as follows if the desired recharge cannot be accomplished in the active channel within the project area or if recycled water recharge is included in the recharge project:

- A diversion works would be constructed in the active channel just upstream of Palmdale Boulevard to split the remaining discharge in Littlerock Creek such that the imported water discharge remaining in Littlerock Creek can completely recharge in the active channel in the project area.
- The diverted imported water would be conveyed to shallow off-channel basins constructed adjacent to the active channel and within the floodplain. Imported water diverted into these basins would recharge completely within the project area.
- The off-channel basins would be constructed in a strip of land parallel to the active channel. A feeder channel would be constructed from the diversion works at Palmdale Boulevard and run along the west side of the off-channel basins. The feeder channel would convey imported water from the Littlerock Creek diversion to individual off-channel basins.

[1] The design duration of recharge will be developed in the proposed feasibility investigation. The duration of recharge will depend on the availability of surplus unused capacity in the East Branch of the SWP that can be used by the PWD, AVEK, and the LCID to convey SWP and non-SWP waters to the Littlerock Creek Recharge Project.

- The imported discharge to Littlerock Creek would be modulated to ensure that all imported water discharged to Littlerock Creek would be completely recharged in the active channel and off-channel basins in the project area.

Recycled water recharge would be accomplished by conveying recycled water to the off-channel basins in the project area. Dilution pursuant to the Department of Public Health draft[2] CCR Title 22 regulations would be provided by SWP water recharged in the same facilities and groundwater underflow. Other project concepts could be introduced, such as:

- Constructing a channel from the East Branch of the SWP aqueduct to Palmdale Boulevard so that recharge operations could occur north of Palmdale Boulevard. Recharging north of Palmdale Boulevard would minimize adverse high groundwater level impacts on existing sand and gravel operators located west of the Littlerock Creek and south of Palmdale Boulevard.
- Phasing the recharge project implementation to match anticipated growth in water demand, the addition of project partners, and the future acquisition of imported water supplies. In this latter case, the ultimate project description would be developed and plans would be developed to include logical modules of additional recharge capacity. For example, the first phase might use the natural stream channel only and subsequent modules could include the construction of a diversion works at Palmdale Boulevard and a gradual extension distribution channel parallel to the natural channel and adjacent spreading basins with the channel extension and number of new spreading basins, determined by the desired additional recharge capacity.

There may be unknown geologic constraints that would limit the ability to recharge imported water in the proposed recharge project area. Possible constraints could include fine-grained sediments that limit infiltration through the surface soils to groundwater, and groundwater flow barriers that could cause mounding and/or impede horizontal flow from the areas of recharge to the proposed recovery wells. The geology in the project area needs to be characterized in sufficient detail to ensure that the recharge and recovery elements in the project will meet the project goals. The presence of these geologic impediments, if they exist, must be incorporated into the project design and operating plans.

The feasibility investigation must develop a series of LCGRRP alternatives that include facilities and operating plans and preliminary cost opinions to construct and operate the LCGRRP alternatives. The feasibility investigation needs to evaluate the subsurface conditions that could limit or influence the design and operation of the LCGRRP alternatives.

What are the current environmental conditions in the proposed LCGRRP area that could limit the use of the land for recharge?

Historically, Littlerock Creek has conveyed stormwater discharge from the San Gabriel Mountains to the valley floor. The fate of the stormwater on the valley floor depended on the magnitude of the

[2] The Department of Public Health has stated that it intends to finalize these regulations in late 2012 or early 2013. The recycled water recharge component in the LCGRRP would be designed consistent with the final regulations.

stormwater event. For small to perhaps moderate floods, the stormwater would recharge in the Littlerock Creek floodplain upstream of the Rosamond Lake dry lakebed. During larger flood events, the stormwater would reach the Rosamond Lake dry lakebed where it would be stored until lost mostly to evaporation and to minor seepage. Imported water recharge operations that utilize the natural streambed for recharge and conveyance cannot occur during stormwater runoff periods if these operations would compromise stormwater management or cause imported and storm waters to discharge onto the dry lake bed and be lost to evaporation. In sum, the proposed recharge project needs to be designed and operated to not exacerbate flooding, to ensure that storm water recharge is not diminished, and to ensure that all imported water discharged to Littlerock Creek completely recharges in the project area.

The feasibility investigation must clearly investigate and articulate the temporal availability of the project site area for artificial recharge such that flooding is not exacerbated, identify design and operating elements to ensure that flood management and natural recharge are not impacted, and identify the institutional arrangements required to incorporate a recharge project in an active floodplain area.

The draft programmatic CEQA document[3] for the PWD's 2010 Strategic Water Resources Plan (SWRP) did not specifically identify biologic resources of concern in the project area but did include a series of mitigation measures that would be implemented during project development and construction. These measures included investigations that would identify sensitive plant and animal species that are present in the project area and would subsequently develop specific mitigation measures to address potential impacts from the project or to refine the design and operations of the recharge project to avoid impacts.[4] The CEQA document for the PWD's SWRP also identified generic concerns and similarly styled mitigation measures for cultural resources and geologic/seismic resources.[5]

The feasibility investigation must clearly investigate and articulate the biologic, cultural, seismic, and geologic conditions in the project area. The feasibility investigation must contain mitigation measures in terms of alterations of the project design and operations, other mitigation measures, and the probable cost of implementing mitigation measures.

What are the groundwater level, quality, and subsidence conditions in the project and surrounding areas, and how would they change with the proposed LCGRRP?

This question speaks the ability to get the water into the groundwater system and to successfully recover the water, and the water level, water quality, and subsidence impacts beyond the immediate areas of recharge and recovery. The following issues need to be addressed:

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[3] Palmdale Water District Strategic Water Resources Plan Draft Programmatic Environmental Impact Report, State Clearinghouse No. 2010101091, August 2011.
[4] See biologic resources impact assessment in the PWD's 2010 SWRP Draft Programmatic EIR, specifically mitigation measures BIO-1a, BIO-2a, and BIO-5a. See table ES-1.
[5] CUL-1a and CUL3a, and GEO1 and Geo-3, respectively. See table ES-1.

- Under recharge project operations, groundwater levels need to be sufficiently deep to not impact recharge, not cause losses to rising groundwater and evaporation, and not cause liquefaction during a seismic event. This means that the no-project groundwater level conditions and the with-project conditions need to be characterized (current, historical, and projected range in groundwater levels for a range of future conditions without the recharge project). The feasibility investigation must evaluate groundwater level conditions in the immediate project area and surrounding areas that could be impacted by recharge and recovery operations for the no-project and the with-project conditions.
- The amount of project recharge that is captured by the project recovery wells needs to be estimated. It is possible that some of the water recharged could escape the capture zone of the project recovery wells. Ideally, the recovery wells would "recover" all of the water recharged by the proposed project. However, if there are prolonged times between recharge and recovery, it is likely that some of the water recharged in the proposed project will escape the recovery wells capture zone. The feasibility investigation must evaluate the range of expected operations and characterize the amount of recharge water recovered by the project and the cost implications of lost recharge.
- The recharge project should not cause water quality at existing wells to degrade to the point of not being useful without mitigation. This means that the water quality constituents of interest need to be identified and the no-project and with-project groundwater quality for these constituents needs to be characterized (current concentrations, historical range of concentrations, and projected range in concentrations without the recharge project). The feasibility investigation must identify water quality constituents of interest, evaluate the range of expected changes in water quality for constituents of interest, evaluate changes in design and operations to minimize deleterious water quality impacts, and the cost to mitigate deleterious water quality.

Given the information developed above, what are the likely recharge alternatives, facility and operating plans, and their cost? What is the implementation plan?

Given the answers to the previous questions, the preliminary LCGRRP alternatives will need to be revised to ensure the LCGRRP can meet its performance goals and limit environmental impacts to acceptable levels. The cost opinions for each LCGRRP alternative will need to be updated and its feasibility assessed. Assuming there are feasible LCGRRP alternatives, an implementation plan will have to be developed and coordinated with stakeholders and project participants. The next steps would likely be a project-specific CEQA process. All the work done in the feasibility investigation could be used directly in the CEQA process.

SCOPE OF WORK

The scope of work described below has been designed to answer the feasibility questions articulated in the Technical Approach described above; to be executed in a logical, transparent, and process-driven manner; and to produce a robust feasibility assessment. This is a complicated project and will require coordination with many agencies and non-governmental organizations. Therefore, the scope includes tasks to disseminate information relatively continuously as the project unfolds, review and coordination among stakeholders, and formal public outreach opportunities. The scope of work consists of nine major tasks, which include:

- Task 1 Project Administration
- Task 2 Update Water Demands and Water Supply Plans for the PWD and Other Stakeholders
- Task 3 Determine the Timing and Magnitude of Imported and Recycled Water for Recharge
- Task 4 Develop Preliminary LCGRRP Alternatives
- Task 5 Conduct Site Specific Investigations to Determine Environmental Issues and Constraints
- Task 6 Assess the Groundwater Response of Each Alternative
- Task 7 Refine LCGRRP Alternatives and Evaluate Feasibility
- Task 8 Prepare LCGRRP Report
- Task 9 Conduct Public Outreach

Table 6-2 in Attachment 6 – Budget is a work breakdown structure that lists these tasks and subtasks in substantial detail, showing the amount of consultant labor resources, labor costs, subconsultant costs, and total costs for each task and subtask. The task objectives and major work elements are described below. Table 6-2 should be reviewed in parallel with the reading of the following task descriptions.

Task 1 Project Administration

This task includes project management (progress and financial management, administration of subconsultant contracts, preparation of monthly progress reports, and invoicing) and meetings. There will be monthly telephonic meetings following invoicing to discuss progress and work to be done in the next billing period. Stakeholder meetings will occur approximately every two months to discuss the technical work in process, evaluate progress and performance, and to receive stakeholder feedback.

Task 2 Update Water Demands and Water Supply Plans for the PWD and Other Stakeholders

The objective of this task is to update the water demand and supply plans for all of the major water supply entities that have demands on the SWP, recycled water, and groundwater. This is being done to take an Antelope Valley-wide view of the water demand and supply plans and to determine how groundwater banking, in general and in the LCGRRP area specifically, can be integrated into the valley-wide water supply plan.

The deliverables for this task include a task report, documenting the work in this task, presentations to the stakeholders within this task effort, and subsequent workshops. The task report will be posted on the project website. This deliverable will be used in Task 4 to develop LCGRRP alternatives.

Task 3 Determine the Timing and Magnitude of Imported and Recycled Water for Recharge

The objectives of this task are to determine the capacity within the East Branch of the SWP to deliver SWP and non-SWP waters to the LCGRRP, to identify the types of non-SWP water that can be conveyed and recharged, and the amount and timing of recycled water that could be recharged at the LCGRRP. This work will identify the range and types of water that can be recharged, the timing of deliveries, and the probable costs of these water sources. Finally, the agreements and processes required to obtain and convey these waters to the LCGRRP will be described.

The deliverables for this task include a task report, documenting the work in this task, and presentations to the stakeholders within this task effort and subsequent workshops. The task report will be posted on the project website. This deliverable will be used in Task 4 to develop LCGRRP alternatives.

Task 4 Develop Preliminary LCGRRP Alternatives

The objective of this task is to develop up to ten preliminary LCGRRP alternatives and to describe them in sufficient detail so that they can be evaluated for performance, environmental challenges, and cost. Basic data will be compiled to ensure that the recharge and recovery elements of the LCGRRP will work and that facility and operating plans can be developed in sufficient detail for evaluations in subsequent tasks. To this end, the following subtasks will be performed:

- Review basic hydrogeologic information, such as borehole logs, geophysical investigations, groundwater level, etc. (the data required for this work is collected and compiled in Task 5.2 [See Table 6-2], which will be completed before Task 4 starts)
- Conduct geophysical investigations to determine the presence of vertical and horizontal barriers (see Task 5 for a description of environmental compliance and permits)
- Conduct a ground surface deformation investigation using InSAR technology[6] to determine how the ground surface responds to recharge and where the recharged water goes
- Conduct a topographic survey using LIDAR[7] technology
- Collect existing and planned potable and non-potable water infrastructure information from the PWD and other potential project participants

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[6] Synthetic Aperture Radar Interferometry (InSAR) measures deformation in the earth's surface over time and can be used to observe the recharge mound beneath the earth's surface and the areas impacted by recharge. In the LCGRRP application, InSAR will be used to determine the slight rise in the Earth's surface following recharge that occurred during the 1998 and 2005 floods on Littlerock Creek and determine where the recharged water went. These observations are important in the identification of recharge areas and horizontal flow barriers.

[7] Light Detection and Ranging (LIDAR) is an optical remote sensing technology that can measure the distance to, or other properties of a target, by illuminating the target with light, often using pulses from a laser. LIDAR would be used herein to develop precise topographic maps for laying out facilities plans.

- Collect existing and planned flood control and road infrastructure information for the project area

This information will be compiled into a GIS and used as a basis to develop alternative facility and operating plans.

Up to ten preliminary facility and operating plans (alternatives) will be developed along the lines discussed earlier in the technical approach section and in the project description. These alternatives, their preliminary cost, and proposed feasibility evaluation criteria will be presented to the stakeholders at a regularly scheduled coordination meeting (Task 1.2.2 in Table 6-2). These preliminary alternatives will be revised by incorporating the comments and suggestions of the stakeholders.

The deliverables for this task include a task report documenting the work in this task, presentations to the stakeholders within this task effort, coordination meetings, and subsequent workshops. The task report will be posted on the project website.

Task 5 Conduct Site Specific Investigations to Determine Environmental Issues and Constraints

The objectives of this task are to identify potential impacts of the LCGRRP alternatives on the hydrological, biological, cultural, and mineral resources; the potential for exacerbating flooding, geological, and seismic hazards; and impacts on groundwater levels, water quality, and subsidence. As to the latter, most of this information was collected during the prior phases of the Antelope Valley adjudication process, is readily available, and only needs to be brought current to 2012. The SWRP draft programmatic EIR contains recommended mitigation measures to evaluate the impacts on these resources when the LCGRRP moves towards implementation. The scope contained herein implements these mitigation measures. This task also includes a thorough evaluation of the groundwater level, water quality, and subsidence conditions in the project area, and area that could be impacted by the LCGRRP. After compiling and analyzing existing groundwater level and groundwater quality data, a determination will be made about whether these data are sufficient to define ambient groundwater conditions to the extent required to evaluate impacts from project alternatives. This proposal assumes that up to ten existing wells may be sampled as part of this project. A sampling and analysis plan (SAP), including a quality assurance project plan (QAPP), and a health and safety plan (HSP) will be developed. Groundwater elevations will be measured using standard protocols specified in the SAP. Groundwater samples will be collected from these wells and submitted to an Environmental Laboratory Accreditation Program (ELAP)-certified laboratory for Title 22 analyses. All groundwater elevation and groundwater quality data will be quality control-checked and uploaded into the project database.

The project will include fieldwork on previously undisturbed areas. We anticipate the need for permits from Los Angeles County and potentially agreements with some private landowners to enter their properties to conduct biologic resource surveys, cultural resource surveys, and geologic and geophysical surveys. The geophysical surveys will require the temporary placements of equipment on the ground and the application of electrical forces at the ground surface. The biological resources, cultural resources and geological resources surveys will be completed prior to the geophysical surveys. These surveys will be used to comply with CEQA for both the geophysical survey and subsequent CEQA review of the LCGRRP.

The investigation proposed herein will require the PWD to contract with consultants to conduct the biological resources, cultural resources and geologic resources surveys, prepare appropriate CEQA documentation prior to conducting the geophysical surveys and potentially to direct the geophysical field work to comply with the adopted CEQA documentation. There are specific line-items for these efforts in the work breakdown structure presented in Attachment 6 - Budget. The amounts budgeted for these efforts are:

- Biological resources -- $30,000
- Cultural resources -- $30,000
- Geological hazards and resources -- $30,000
- CEQA documentation for geophysical survey -- $30,000

When the feasibility investigation is completed the PWD will complete CEQA documentation on the LCGRRP alternatives identified in the feasibility investigation prior to design.

The deliverables for this task include two task reports documenting the work in this task, presentations to the stakeholders within this task effort, coordination meetings, and subsequent workshops. The task reports will be posted on the project website. These deliverables will be used in Tasks 6 and 7 to evaluate the groundwater response and revise the LCGRRP alternatives as necessary to be implementable.

Task 6 Assess the Groundwater Response of Each Alternative

The objectives of this task are to evaluate the hydrogeologic feasibility of the LCGRRP; to evaluate the groundwater level, water quality, and subsidence impacts of the preliminary LCGRRP alternatives; and finally to suggest refinements to the preliminary LCGRRP alternatives that improve project performance and minimize impacts to the groundwater resource. The scope includes the update of the 2012 USGS groundwater flow and subsidence model of the Antelope Valley,[8] the development of a companion solute transport model[9] to assess the fate and transport of the water quality constituents of interest, and the application of these models to evaluate the groundwater level, water quality, and subsidence responses for the no-LCGRRP (baseline) alternative and the LCGRRP alternatives developed in Task 4. The groundwater modeling results of the LCGRRP alternatives will be compared to the baseline alternative to estimate the LCGRRP impacts to the groundwater system. The scope includes a feedback loop to suggest modifications to some of the alternatives to minimize impacts or to improve the LCGRRP alternative performance.

[8] The USGS is in the process of preparing a final report to document their latest investigation of groundwater level and subsidence conditions in the Antelope Valley and the evaluation of planning alternatives. Their final report should be available before the end of calendar 2012.

[9] A solute transport model, such as the MT3D or its functional equivalent, would be used to assess the fate and transport of water quality constituents of interest.

The deliverables for this task include a task report documenting the work in this task, presentations to the stakeholders within this task effort, coordination meetings, and subsequent workshops. The task report will be posted on the project website. This deliverable will be used in Task 7 to refine the LCGRRP alternatives and to evaluate feasibility.

Task 7 Refine LCGRRP Alternatives and Evaluate Feasibility

The objective of this task is to take the results of Tasks 5 and 6, to update (finalize) the preliminary LCGRRP alternatives, update their cost opinions, and assess their feasibility. An implementation plan will be developed for the feasible LCGRRP alternatives.

The deliverables for this task will include a task report documenting the work in this task, presentations to the stakeholders within this task effort, coordination meetings, and a public workshop (Task 9.4 in Table 6-2). The task report will be posted on the project website.

Task 8 Prepare LCGRRP Report

The objective of this task is to prepare a completion report for the entire feasibility investigation. This process includes the preparation and submittal of a draft report, the preparation of comments and suggestions by the stakeholders, the preparation and submittal of responses to comments and suggestions, and the preparation of the final draft of the completion report.

The deliverables for this task include the draft report, formal responses to comments and suggestions, and the final report. The draft report, responses to comments, and the final report will be posted on the project website.

Task 9 Conduct Public Outreach

The objective of this task is to disseminate information related to the LCGRRP feasibility investigation to all groundwater users, project stakeholders, Antelope Valley groundwater adjudication litigants, and the general public, and to provide a forum to publically and transparently provide input to the LCGRRP proponents. The following public outreach efforts will be made:

- A website will be created to allow public access to the task reports, meeting and workshop notices, agendas, presentations and minutes, and the final report.
- Three public workshops will be conducted to review the preliminary LCGRRP alternatives (Tasks 2, 3 and 4), the alternative performance and impact analysis (Tasks 5 and 6), and to review the final LCGRRP alternatives and feasibility (Task 7).
- The results of this feasibility investigation will be disseminated to all the litigants in the ongoing Antelope Valley groundwater adjudication through the continuing mediation process and the Antelope Valley IRWMP process.
- Progress reports and the final report will be presented at two annual meetings of the Association of California Water Agencies, the annual conference and meeting of the

Groundwater Resources Association (GRA) of California, and at two specialty GRA conferences where specific technological innovations and applications are discussed.

The deliverables for this task include the creation and maintenance of a project website, three public workshops, and five conference presentations.